

CMSC 132:

OBJECT-ORIENTED PROGRAMMING II



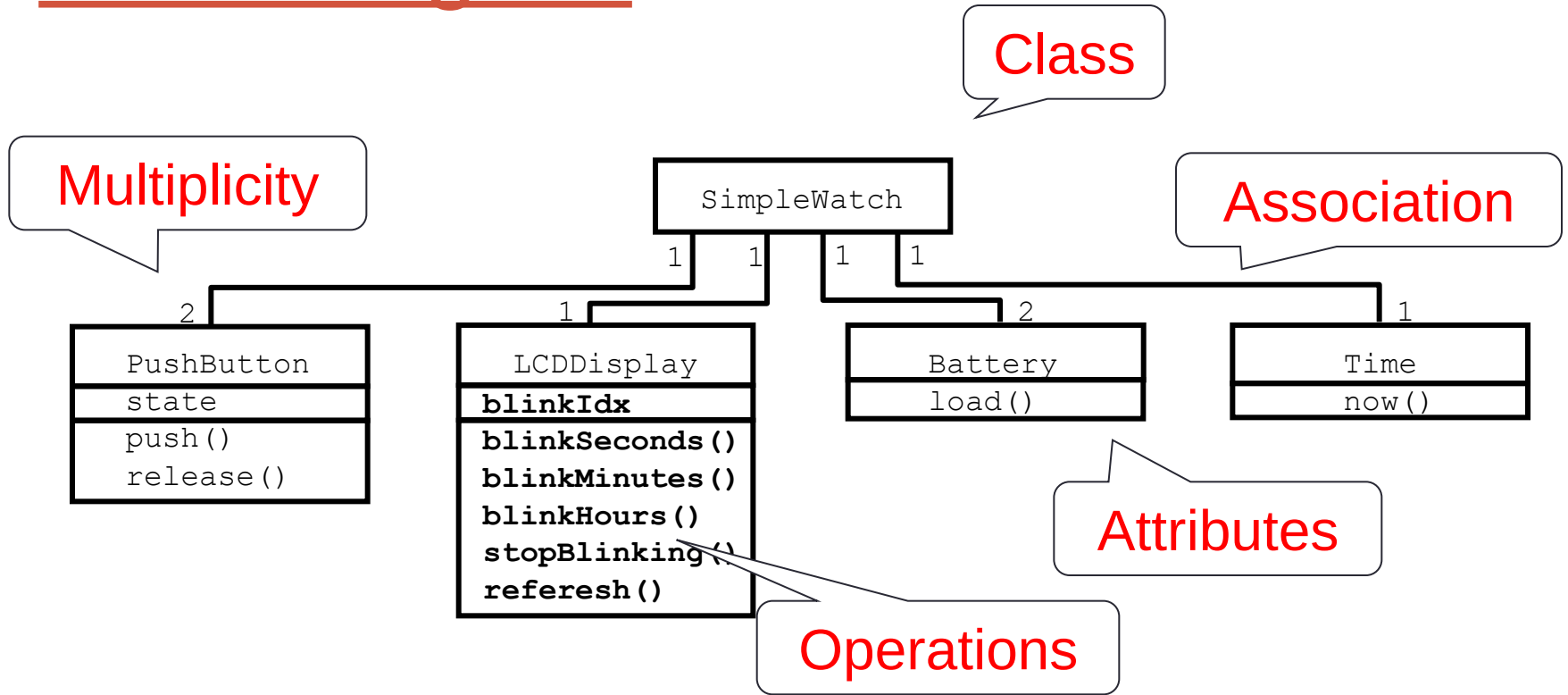
UML (Unified Modeling Language)

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UML (Unified Modeling Language)

- UML is a modeling language for object-oriented software that allow us to specify, visualize, construct and document systems
- Use UML to help visualize design of software
- UML provides a number of **diagrams** that
 - Describe a **model** of all or part of system
 - From a particular point of **view**
 - With varying level of abstraction
- We want to use class diagrams to describe our designs
- Class diagram
 - Represents (static) structure of system
 - It displays
 - Information for class
 - Relationships between classes
- NOTE:
 - In this class we are going to use UML Class diagrams very informally (you don't need to adhere to UML class diagrams rules)
 - We will use them to provide description of designs
 - You will see UML formally in later courses

Class Diagram



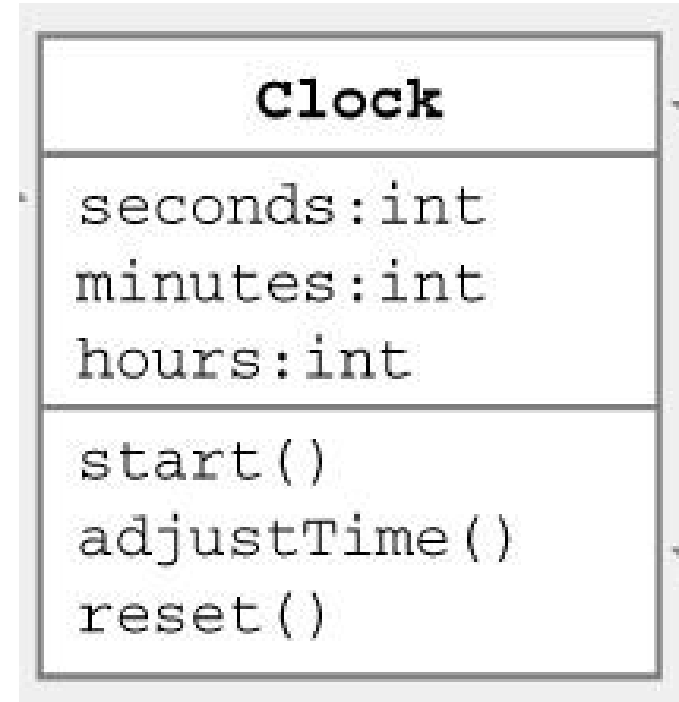
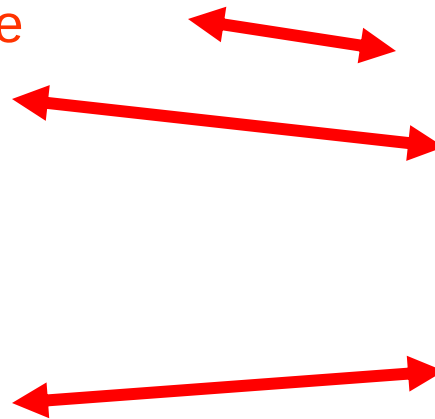
Class diagrams represent structure of system

Java → UML : Clock Example

- Java

```
class Clock { // name
    // state
    int seconds;
    int minutes;
    int hours;
    // behavior
    void start();
    void adjustTime();
    void reset();
}
```

Java Code



Class Diagram

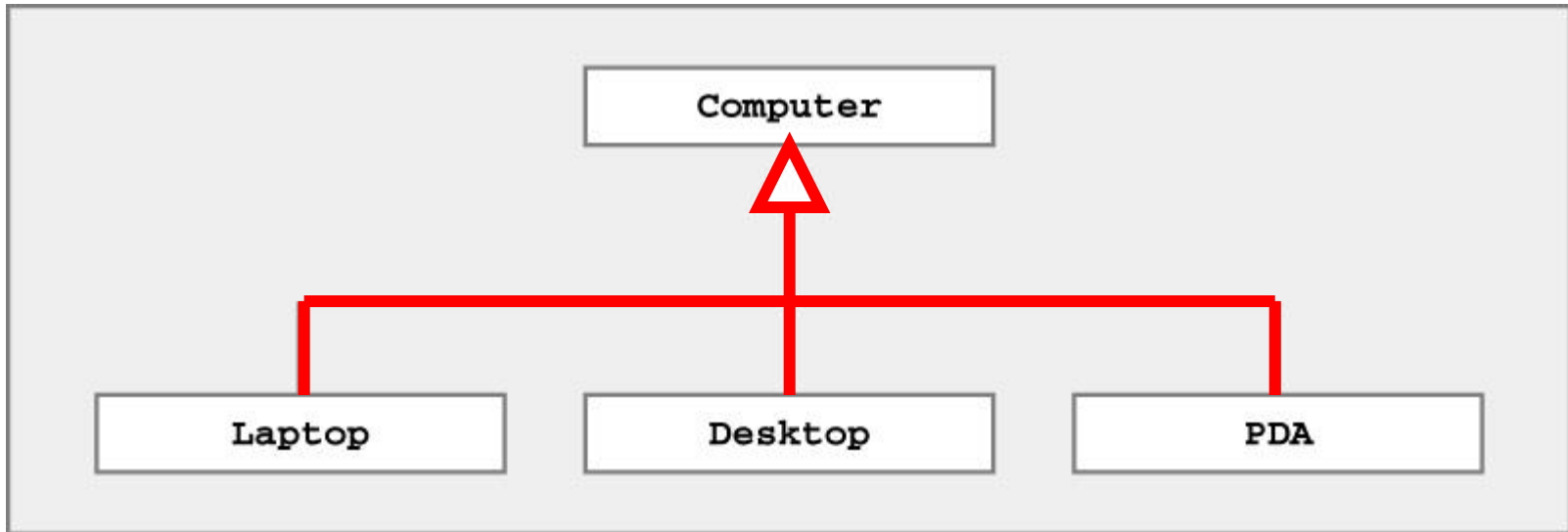
Generalization

- Denotes inheritance between classes
 - Can view as “is a” relationship
- Example
 - Lecturer is a person (Lecturer extends Person class)
- Types of generalization
 - Subclass extends superclass
 - Solid line ending in (open) triangle
 - Class implements interface
 - Dotted line ending in (open) triangle



Generalization Example

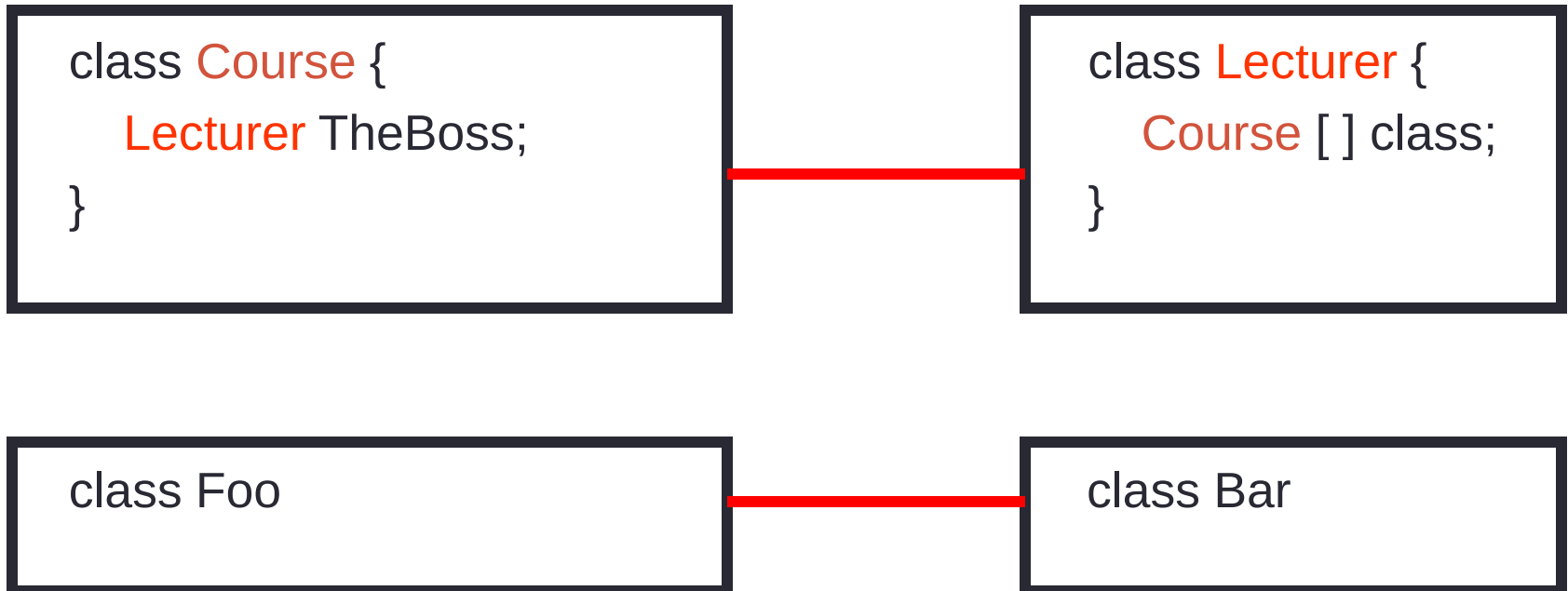
- Inheritance



**Laptop, Desktop, PDA inherit
state & behavior from Computer**

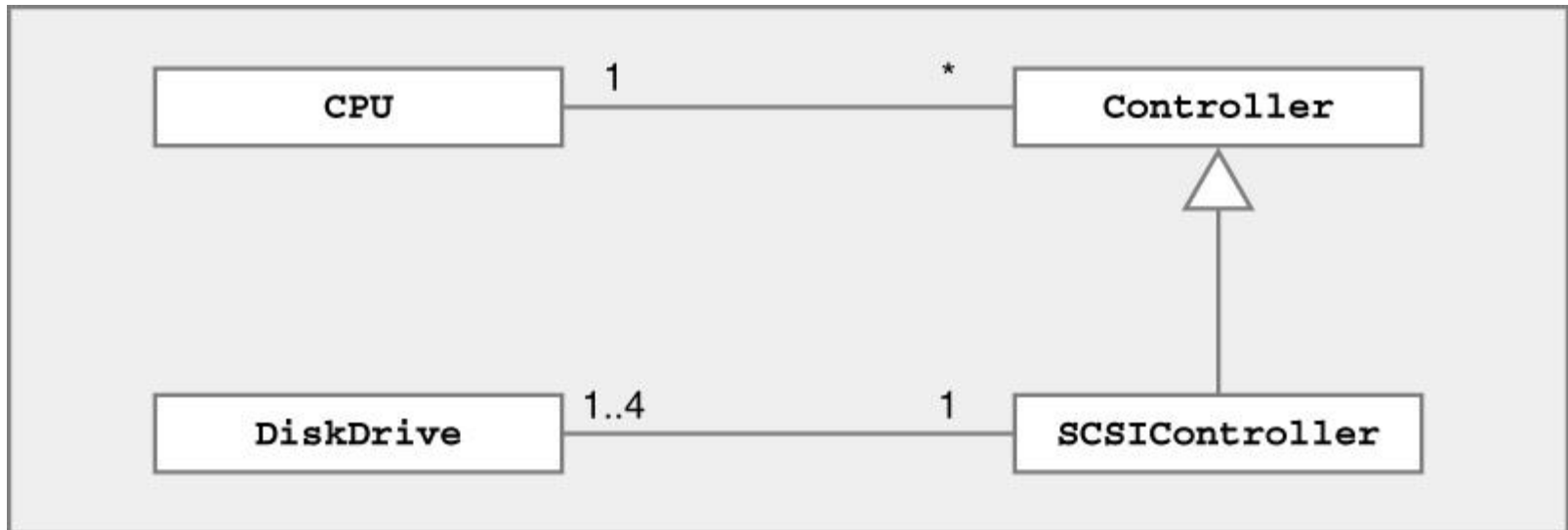
Association w/o Navigation

- Undirected edge
 - Relationship between classes may be bi-directional
 - Direction of relationship may be unknown
- Examples



UML Example – Computer System

- Try to read & understand UML diagram



- CPU is associated with Controllers
- DiskDrive is associated with SCSIController
- SCSIController is a (type of) Controller